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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

KEMMERLE III, RUSSELL J

ART UNIT

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1791

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/724,615	Applicant(s) IMANAKA ET AL.	
	Examiner RUSSELL J. KEMMERLE III	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21, 22 and 24-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21, 22 and 24-31 is/are rejected.
- 7) ☒ Claim(s) 32-35 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>21 November 2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

In view of the Applicant's remarks in response to the previous Office action, the rejection of claim 32 under 35 U.S.C. 112, first paragraph, is withdrawn.

Claim Rejections - 35 USC § 103

Claims 21, 22, 24-27 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuki (US Published Application 2006/0,165,875) in view of Miyazaki (U Published Application 2001/0,010,617) and Ushikoshi (US Patent 5,683,606).

Referring to claim 21, Otsuki discloses creating a substrate by forming several layers, each layer containing conducting and insulating regions, the layers being formed sequentially on top of one another (see Claims 1-5). Specifically, Otsuki discloses forming multiple regions on an individual layer of different materials, then forming directly on top of that layer, a second layer comprised of multiple regions and multiple materials, which is continued with layers being built directly on top of each other (see pages 3-4, paragraphs 0095-0134). Otsuki specifically discloses that the structure is formed on a substrate (i.e., a base), which is later removed (Page 12, sixth embodiment, paragraphs 288-289).

Otsuki does not disclose the method of forming the layers by screen-printing each of the conducting and insulating regions.

Miyazaki discloses screen printing a layer of conductive material over a base layer (page 4, paragraph 0061) and then screen printing a ceramic layer on the base layer in the areas in which the conductive material was not printed, thus forming a layer having both a conductive material region and a ceramic material region (page 4, paragraph 0062). Miyazaki goes on to disclose releasing the created layer from the support it was printed on (page 4, paragraph 0064) and firing the layer (page 4, paragraph 0065).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to modify the method taught by Otsuki by depositing the material by screen printing as taught by Miyazaki since Otsuki discloses the method of forming the substrate by depositing layers of conducting and insulating regions on top of the previous layer, and Miyazaki discloses that screen printing is an effective means for depositing regions of conducting and insulating materials (page 4, paragraph 62).

Otsuki and Miyazaki fail to disclose using a material to act as a stress-mitigating region between two other regions.

Ushikoshi discloses placing a protective or stress mitigating layer between different materials to reduce the likelihood of cracks or other problems in the laminated piece (Col 9, lines 1-5).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to modify the method taught Otsuki and Miyazaki of screen printing a layer containing both an insulative and conductive region by adding a third stress mitigating region as taught by Ushikoshi since Otsuki and Miyazaki place no limit

on the number of regions which could be screen printed on one layer, and Ushikoshi discloses the desirability of a stress mitigating layer to help reduce cracking and other problems in a laminated piece. It would have been within the abilities of one of ordinary skill in the art to alter the teachings of Ushikoshi in order to optimize the material used in the stress mitigating layer based on the properties of the material desired (i.e., electrical or mechanical properties) and the stress mitigating properties desired (i.e., shrinkage during sintering or thermal expansion during operation).

Referring to claim 22, Otsuki is relied upon as discussed above. Otsuki further teaches forming electronic components (such as a capacitor, resistor, diode, transistor, etc.) in one or more of the layers of the substrate by depositing a material with the desired characteristics on one of the layers (see Claims 14-18). Otsuki discloses creating several different types of electronic components (e.g., capacitor, resistor, diode, transistor, etc.), which would necessarily have different dielectric constants.

Referring to claim 24, Ushikoshi discloses using Molybdenum Carbide as a stress-mitigating region between regions of Molybdenum metal and Molybdenum Oxide (the Molybdenum having at least one component from the material on each side of it, in both cases Molybdenum) (Col 8 lines 29-36).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to modify the method taught Miyazaki of screen printing a layer containing both an insulative and conductive region by adding a third stress mitigating region as taught by Ushikoshi since Miyazaki places no limit on the number of regions which could be screen printed on one layer, and Ushikoshi discloses the desirability of a

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stress mitigating layer to help reduce cracking and other problems in a laminated piece. It would have been further obvious to one of ordinary skill in the art, at the time of invention by applicant, to have created the stress mitigating region using a material with a composition middle between the two proximate materials since Ushikoshi discloses using Molybdenum Carbide as a stress mitigating region between regions of Molybdenum metal and Molybdenum Oxide.

Referring to claim 25 Otsuki is relied upon as discussed above. Otsuki further teaches forming a conductive section inside an insulative layer to electrically connect conductive sections above and below the insulative layer (i.e., a via) (page 12, paragraph 0286).

Referring to claim 26, Otsuki is relied upon as discussed above. Otsuki further discloses that the via is formed by depositing a post on top of a conductive section to electrically connect the lower conductive layer to an upper conductive layer (page 12, paragraph 0286).

Referring to claim 27, Miyazaki further discloses that conductive paste can be screen printed on to a base layer, in order to form a conductive layer (page 1, paragraph 7).

Referring to claim 29, Otsuki is relied upon as discussed above. Otsuki discloses creating a capacitor in the substrate (page 13, paragraph 0294) and other electronic components (such as a resistor, diode, or transistor) (Claims 14-18).

Referring to claim 30, Otsuki is relied upon as discussed above. Otsuki further discloses placing a second layer of an insulative material over the conductive layer to

bury it (see Fig 23, showing conductive layers, 410 and 412, completely covered by an insulative layer, unnumbered).

Referring to claim 31, Otsuki is relied upon as discussed above. Otsuki further discloses a first and third layer made of a conductive material, and a second layer made out of an insulator to form a capacitor (i.e., a passive element) (page 13 paragraph 0294).

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsuki, Miyazaki and Ushikoshi in view of Yamana (US Published Application 2003/0,230,374).

Otsuki, Miyazaki and Ushikoshi are relied upon as discussed above in the rejection of Claim 27.

Otsuki and Miyazaki do not disclose, after screen-printing a conductor layer on the base layer, pressurizing the basic layer and conductor layer to planarize the basic layer and conductor layer.

Yamana discloses coating an electrode paste on to a ceramic green sheet, and then subjecting the combined layer to a pressure in order to smooth it (page 6, paragraph 0093, Claim 1).

It would have been obvious to one of ordinary skill in the art, at the time of invention by the applicant, to modify the method of screen printing a conductive layer on to a base layer as taught by Otsuki and Miyazaki by adding the step of applying pressure to the combined layer to smooth the surface as disclosed by Yamana, since Yamana discloses that adding the step of pressurizing the layer helps reduce cracking and delamination in the final piece.

Allowable Subject Matter

Claims 32-35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Referring to claim 32, prior art was not found to reasonably suggest using multiple stress mitigating layers in a ceramic structure.

Referring to claim 33, prior art was not found that disclosed the specific combination of materials recited therein to create a ceramic substrate.

Response to Arguments

Applicant's arguments filed 22 April 2008 have been fully considered but they are not persuasive.

Applicant argues that no reason has been given why one skilled in the art would replace the ink or bubble jet process of Otsuki with the screen printing method of Miyazaki. However, as discussed both above and in the previous Office action, Miyazaki and Otsuki both discuss equivalent methods of forming a substrate layer of different materials to achieve a layer having multiple regions. "Express suggestion to substitute one equivalent for another need not be present to render such substitution obvious." In re Fout, 675 F.2d 297 at 301, 213 USPQ 532 at 536 (CCPA 1982).

Applicant argues that the proposed combination renders Miyazaki inoperable. This is not considered to be persuasive because Miyazaki provides no indication that it

would not work, and Otsuki discloses that similar methods of depositing substrate levels can effectively be built up in multiple layers. Therefore one of ordinary skill in the art would assume that the method of Miyazaki could be carried out in the same way.

Applicant next argues that Ushikoshi discloses only a ceramic heater which is different than the ceramic substrates of the current invention. However, Ushikoshi is relied upon for the teaching of placing an intermediary layer between two different materials in order to mitigate the stresses when the structure undergoes a non-uniform change in dimension. Therefore, one of ordinary skill in the art would have looked to such a teaching when firing the ceramic substrates of the current invention and other prior art references as discussed above in order to deal with the stresses developed during shrinkage of the body during firing.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RUSSELL J. KEMMERLE III whose telephone number is (571)272-6509. The examiner can normally be reached on Monday through Thursday, 7:00-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. J. K./
Examiner, Art Unit 1791
/ Carlos Lopez/
Primary Examiner, Art Unit 1791